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ASYMPTOTIC POWERS OF ONE- AND TWO-SAMPLE RANK TESTS AGAINST LOCATION-ALTERNATIVES INCLUDING CONTAMINATION

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1. Introduction

For the nonparametric hypotheses of symmetry about zero and equality of distribution functions in one- and two-sample problems, we often consider only location alternatives. But after treatments are received, we cannot predict enough that many observations give rise to only variation of location of a distribution. In fact, Lehmann, in [2], considered three sorts of alternatives which are not the location alternatives and, in Section 7 A of Chapter 2 of [3], pointed out that the location alternative may be an oversimplication. So in this paper, we consider the alternative distribution of the form $(1-\varepsilon)F(x-\theta)+\varepsilon H(x-\theta)$ for the null distribution of the form $F(x)$ and discuss asymptotic powers of one- and two-sample rank tests under contiguous sequences of the above alternatives. When $F(x)$ and $H(x)$ are symmetric distributions about zero, θ is the mean and the median of $(1-\varepsilon)F(x-\theta)+\varepsilon H(x-\theta)$. Then it follows that we test whether the mean equals zero or not in the one-sample case and the difference of the two means of the two-sample case.

In Section 2, we shall state the one-sample case and will show that asymptotic relative efficiencies (ARE's) of signed rank tests with respect to the t-test are equivalent to the classical ARE-results against shift alternatives for the distribution $H(x)$ that is symmetric about zero and that ARE of the signed rank test based on normal scores with respect to the t-test is one for $F(x)=$normal irrespective of $H(x)$ and that the Wilcoxon signed rank test is asymptotically most powerful for $F(x)=$logistic and $H(x)=\{F(x)\}^2$. In Section 3, we shall give results of the two-sample case similar to some results obtained in Section 2 and will discuss asymptotic powers of k-sample rank tests additionally.

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